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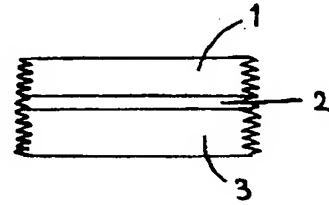
(56) Documents Cited  
WO 94/22667 A US 5370960 A

(58) Field of Search  
UK CL (Edition O ) B6C CBQC CSAA CSAD CSAX  
INT CL<sup>6</sup> G03G

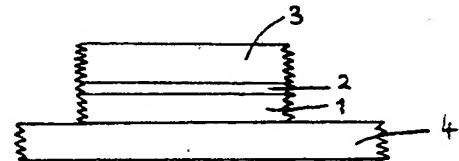
## (54) Producing paperless laminates with electrographic images

(57) A paperless laminate carrying an electrographically printed image can be made by (i) electrographically printing an image on a sheet material that comprises a paper backing (3) and a dielectric image-receiving layer (1) and optionally an adhesive layer (2) between layers (1) and (3); (ii) causing the printed sheet material to adhere by its image-receiving surface (1) to a paperless substrate (4); (iii) wetting the paper backing and (iv) stripping the wetted paper backing (3) to leave the image-receiving coating layer (1) adhering to the paperless substrate (4). Alternatively step (ii) can involve using a weakly-adhesive substrate surface, and thereafter (iii) wetting the paper backing; (iv) stripping the wetted paper backing; (v) causing the surface of the coating layer exposed by stripping step (iv) to adhere to a relatively strong adhesive paperless substrate; and (vi) stripping off the weakly adhesive substrate. Such a paperless printed laminate can comprise an electrographically printed image-bearing layer on a substrate selected from glass, metal, or plastics in sheet or in solid form.

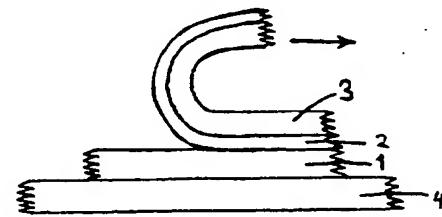
(a)



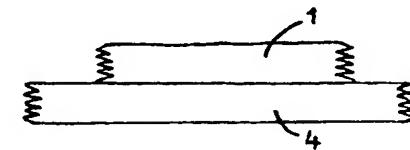
(b)



(c)



(d)



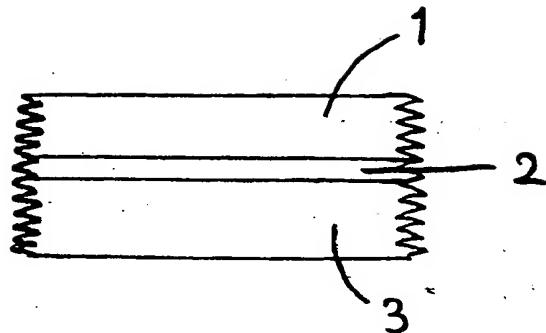
GB 2 306 136 A

At least one drawing originally filed was informal and the print reproduced here is taken from a later filed formal copy.

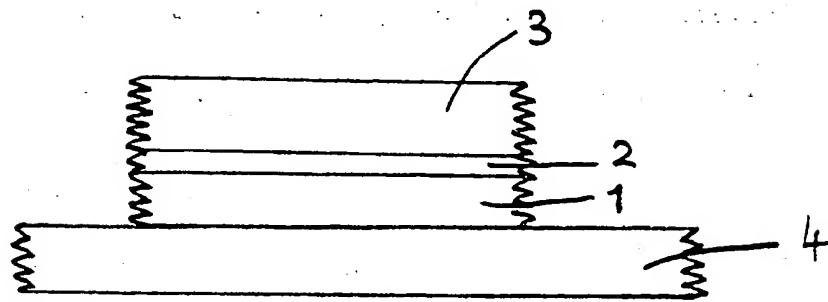
The claims were filed later than the filing date within the period prescribed by Rule 25(1) of the Patents Rules 1995

11  
Figure

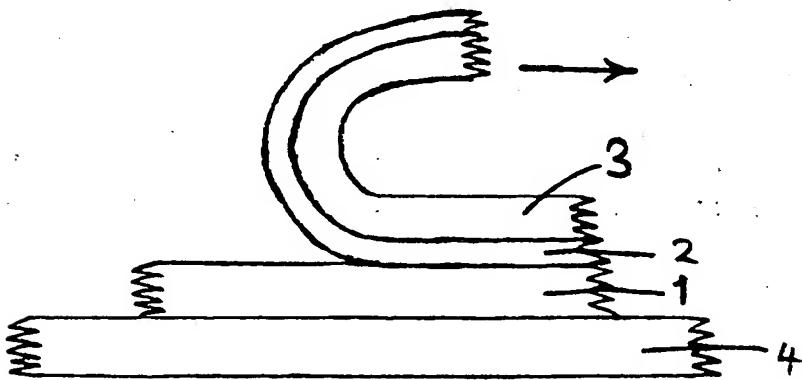
(a)



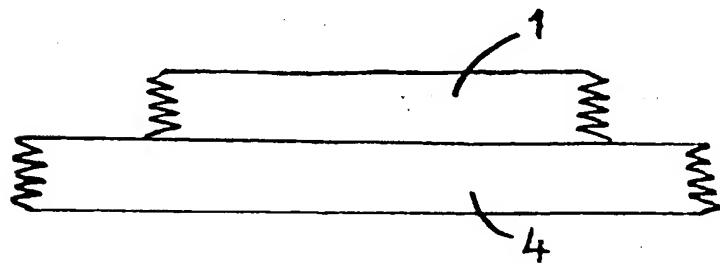
(b)



(c)



(d)



## PRINTED LAMINATES AND THEIR PRODUCTION

Field of the invention

This invention relates to printed laminates and their production.

5

Background of the invention

It is known to use electrostatic plotters and electrographic printers for the production of a wide range of printed images, for example text, drawings, maps, and photographs, including computer-generated images of these and further kinds, in both monochrome and full colour, e.g. full-color electrographic images for use on large format posters, billboards and the like.

Various media are known for receiving such electrostatically-printed images. They comprise receptor sheets for receiving donor material in imagewise fashion: a heat and/or pressure sensitive resin is used, e.g. a toner which also forms the image. Examples of prior art media are given in WO 94/22667 (Rexham Graphics), which also mentions a variety of print materials and accessories standard in this art.

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Convenient and inexpensive media include paper-based media; they comprise paper backing and a coating layer with dielectric and other properties suitable for receiving and fixing electrographically-formed imagewise material, often the coating layer is fixed to the paper backing by an adhesive layer.

But paper printed products are sometimes unsuitable as such for some of the uses for which printed materials are required. A problem arises especially with for example posters and notices for outdoor use, where exposure to wet weather is likely, and for other uses where more physical robustness is required than can be provided by paper products.

Prints for outdoor use often are printed on paper of e.g. 150 g/sq.m thickness to improve durability. Nevertheless, paper can still react badly to atmospheric moisture.

To meet the need for robustness or weatherproofing, various plastics

5 Laminating systems have been devised. In one such known arrangement, a printed sheet, for example a paper sheet, is laminated between transparent plastics sheets to which the paper is fixed by adhesive. It is usual to provide edge-sealing for such a laminate in order to prevent access of moisture to the enclosed paper layer.

10 There are alternative, but expensive, printing media for making laminates for outdoor use. Further and more complex and costly laminating systems are also known.

15 The present inventor considers that it remains desirable to provide further and more convenient printing and laminating arrangements, capable of resulting in paperless printed laminates.

20 15 Summary and description of the invention

25 In one embodiment, the present invention provides a process for forming a paperless laminate that carries an electrographically printed image, the process comprising the steps of (i) forming, by electrographic printing, an image on a sheet material that comprises a paper backing layer and an image-receiving surface comprising a coating layer having dielectric and other properties suitable for receiving and fixing electrographically-formed imagewise material; (ii) causing the printed sheet material to adhere by its image-receiving surface to a paperless substrate surface; (iii) wetting the paper backing layer with an aqueous softening agent; and (iv) stripping the wetted paper backing layer to leave the image-receiving coating layer adhering to the paperless substrate.

30 Also provided by the invention are paperless printed laminates obtainable by the process of the invention.

35 The process of the invention enables production of a wide variety of paperless laminates carrying electrographically printed images in a convenient and economical way.

'Image', in this specification, includes text, drawing, photograph,

computer-generated pattern or any other pattern that can be printed.

The water-based softening agent referred to above can be for example a dilute aqueous salt solution or a weak detergent solution, or water.

5

The result of the procedure of the invention is often to produce a laminate in which the image-bearing layer is visible through a transparent sheet material.

10 If desired, the process of the invention can be modified as follows:

In this version of the process of the present invention, the process comprises the steps of (i) forming by electrographic printing an image on a sheet material that comprises a paper backing layer and an image-receiving surface comprising a coating layer having dielectric and other properties suitable for receiving and fixing electrographically-formed imagewise material; (ii) causing the printed sheet material to adhere by its image-receiving surface to a weakly adhesive substrate surface; (iii) wetting the paper backing layer with an aqueous softening agent; (iv) stripping the wetted paper backing layer to leave the image-receiving coating layer adhering to the substrate; (v) causing the surface of the coating layer exposed by stripping step (iv) to adhere to a relatively strongly adhesive paperless substrate surface; and (vi) stripping off the weakly adhesive substrate.

25

The result of this process can be a paperless laminate, a further product provided according to the invention, in which the original image-receiving coating is visible directly from the direction in which it was printed, i.e. not through the interposition of a transparent sheet material.

30

Among the materials, including sheet materials, to which an image-bearing layer from electrographic paper can be transferred in accordance with a process of this invention are: glass, metal, transparent or non-transparent plastics such as pvc, polycarbonate, Tyvek (TM), vinyl, including backed double-sided coated vinyl, polypropylene in sheet or solid form, polypropylene film, and others.

35

Weak or strong adhesives can be chosen according to need: especially with regard to the possibility of a second-stage transfer to a more strongly adhesive sheet.

5 Examples and Drawings

Examples of the printing and laminating process are described herein for illustration only, and without intent to limit the invention.

10 Reference is made to the accompanying drawing, in which parts (a), (b), and (c) show in diagrammatic and fragmentary section the stages of carrying out an example of a process according to the invention.

15 It is convenient to use in connection with the present invention for example electrographic paper from Rexham Graphics (TM), e.g. premium report grade, 80 g/sq.m. or 75 or 100 g/sq.m, often available in sheets 54" wide, in rolls e.g. of 400' length, which can be printed on a printer such as a Xerox (TM) 8954 (formerly Versatec (TM)) electrostatic/electrographic printer, which is convenient for use in 20 the present connection.

(The thinner grades of the papers mentioned are easier to handle according to this invention: thicker papers require more wetting.)

25 Alternative and suitable electrographic papers are available from Indel-Davis Inc, of Tulsa, Oklahoma.

30 These materials generally comprise paper with a white or other coloured charge-accepting and image-accepting coating layer adhesively bonded to its surface: the coating layer is suitable for receiving electrostatically printed images. It has been found that the coating layers, though not coherent enough to support themselves as a free film or sheet material without support, are sufficiently coherent to be transferred in the manner described herein from one support material 35 (generally paper) to an alternative laminating material, preferably paperless.

Example 1:

Referring to the accompanying figure (see part (a)), an electrographic paper (Rexham Graphics, see above, 75-80 g/sq.m.) comprising an image-receiving coating 1 adhering by a bonding layer 2 to a paper backing 3, is printed with an image. The printed paper-base material can then be made to adhere, (see part (b) of the figure) by its image-receiving layer 1, to a surface, e.g. an adhesive surface, of for example transparent application vinyl sheet material or glass, indicated at 4. The paper layer 3 is then thoroughly wetted with water e.g. with a cloth or spray, and is then stripped from one corner (see part (c) of the Figure). After stripping the paper 3, the result (part (d)) is a paperless laminate of the image-bearing layer 1 that originally coated the paper, attached to a layer of vinyl or glass. This laminate can be used in several different ways, e.g. just as it results from this process. The image can be seen through the vinyl or glass. The paperless laminate can be used outdoors if desired, without deterioration due to moisture attack on a paper layer.

Alternatively the surface of the image-bearing coating layer 1 that is exposed by the stripping of the paper layer 3 can itself be made to adhere to for example double-sided adhesive transparent film such as polypropylene film (not shown in the Figure), which can in turn be made to adhere to any convenient backing material, which may be transparent or not, such as plastics, wood or metal. While the initial laminate (part (d)) is paperless, and for many purposes a paperless laminate is desirable, it is within the scope of the invention, after stripping of the paper layer, to make the resulting laminate adhere to a paper, card or board backing if that is required for a purpose in view.

Example 2:

An electrographic paper is printed with an image, as in Example 1. The printed paper-base material can then be made to adhere to an adhesive surface of for example perspex, polycarbonate, or other transparent sheet material, either rigid or flexible sheet material. Further processing similar to that in Example 1 can be applied if desired.

The result of Examples 1 and 2 is to produce a laminate in which the

image-bearing layer is visible through a transparent sheet material.

The use of glass as a material on which to transfer the printed layers particularly leads to outdoor resistance in the finished product.

5

Optional extra print layer(s), e.g. screen print layer(s), can be printed on if desired. According to certain examples of the invention, this can be used to further advantage in increased brightness of colour, which can be achieved by printing coloured inks on to the charged layer, e.g. after the transfer of the (printed) charged layer in any of the ways mentioned herein. Suitable inks to use in this connection include Polydyne (TM) inks available from Sericol Group (TM).

10

15 Use can sometimes be made of a security advantage in that the resulting product often cannot be delaminated again.

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The invention is susceptible to many modifications and variations, as will be apparent, from the present description and drawings, to a reader skilled in the field concerned, and the present disclosure is intended to extend to combinations and subcombinations of the features mentioned herein, or shown in the drawings, or described in the document(s) cited herein, which are hereby incorporated by reference.

CLAIMS:

1: A process for forming a paperless laminate that carries an electrographically printed image, the process comprising the steps of

5 (i) forming, by electrographic printing, an image on a sheet material that comprises a paper backing layer and an image-receiving surface comprising a coating layer having dielectric and other properties suitable for receiving and fixing electrographically-formed imagewise material;

10 (ii) causing the printed sheet material to adhere by its image-receiving surface to a paperless substrate surface;

(iii) wetting the paper backing layer with an aqueous softening agent;

15 and

(iv) stripping the wetted paper backing layer to leave the image-receiving coating layer adhering to the paperless substrate.

20

2: A process for forming a paperless laminate that carries an electrographically printed image, the process comprising the steps of

25 (i) forming, by electrographic printing, an image on a sheet material that comprises a paper backing layer and an image-receiving surface comprising a coating layer having dielectric and other properties suitable for receiving and fixing electrographically-formed imagewise material;

30 (ii) causing the printed sheet material to adhere by its image-receiving surface to a weakly-adhesive substrate surface;

(iii) wetting the paper backing layer with an aqueous softening agent;

35 (iv) stripping the wetted paper backing layer to leave the image-receiving coating layer adhering to the substrate;

(v) causing the surface of the coating layer exposed by stripping step  
(iv) to adhere to a relatively strong adhesive paperless substrate  
surface; and

5 (vi) stripping off the weakly adhesive substrate.

3: A process according to claim 1 or 2, in which an extra print  
layer, such as a screen print layer, is applied to the layer charged  
10 with the image in the laminate produced by the steps of claim 1 or  
claim 2.

4: A process according to claim 3, in which said extra print layer  
15 comprises coloured ink.

5: A paperless printed laminate obtainable by a process according to  
any preceding claim.

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6: A paperless printed laminate according to claim 5, comprising an  
electrographically printed image-bearing layer on a substrate selected  
from glass, metal, transparent or non-transparent plastics material or  
25 the like, in sheet or in solid form.

30

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The  
Patent  
Office  
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Application No: GB 9520898.9  
Claims searched: 1-6

Examiner: Meredith Reynolds  
Date of search: 3 January 1997

**Patents Act 1977**  
**Search Report under Section 17**

**Databases searched:**

UK Patent Office collections, including GB, EP, WO & US patent specifications, in:

UK CI (Ed.O): B6C(CBQC,CSAA,CSAD,CSAX)

Int CI (Ed.6): G03G

Other:

**Documents considered to be relevant:**

Category	Identity of document and relevant passage	Relevant to claims
X	WO94/22667A (REXHAM)(Figs, esp 7-10, pages 13-16)	1,5-6
X	US5370960 ( " )(Figs and Cols 3-7)	2, 5-6

X Document indicating lack of novelty or inventive step  
Y Document indicating lack of inventive step if combined with one or more other documents of same category.  
& Member of the same patent family

A Document indicating technological background and/or state of the art.  
P Document published on or after the declared priority date but before the filing date of this invention.  
E Patent document published on or after, but with priority date earlier than, the filing date of this application.

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